REMARKS

Status of Claims

Claim 13 is amended based on paragraphs [00020] and [00021] of the specification as filed. New claims 22-30 are added based on paragraph [00020] of the specification as filed, as well as the figures and associated text.

Claim Rejections - 35 USC § 102

Claims 13-21 are rejected under 35 U.S.C. §102(b) as being anticipated by Kamimura et al (5,321,224).

Applicants respectfully traverse.

To anticipate, the cited reference must teach every element of the rejected claim.

Both Kamimura et al and the present inventors address the same problem – stresses between an area with high heat loading (and thus high expansion) and a bordering region with lower heat loading (and thus less expansion), and the stress-induced cracks in the intermediate area produced by differential heat loading, in particular in engine components.

However the solutions are quite different. The present manipulative steps are not taught by Kamimura et al.

Kamimura et al treat the symptom by putting a patch ("overlay welding") with an additive of a heat resistant metal on the surface of the component to prevent surface cracks.

The present inventors in contrast cure the source of the problem by identifying an internal area with high thermal loading (and thus expansion), and reducing the thermal coefficient of expansion in this higher loaded area, such that when the component is heated, an even expansion is produced, despite differences in heat loading between the high and the low heat loaded areas.

For this reason claim 13 includes the recitation "to develop in the thermal higher loaded area (4) a lower thermal coefficient of expansion (α_2) relative to the thermal lower loaded area (5), such that during operation of the internal combustion engine an even expansion occurs in said thermally higher loaded area relative to said another area." Kamimura et al do not teach this deliberate, result-effecting step.

Claims 22, 23 and independent claim 28 recite that the additive is a ceramic material is in the form of powder or bristles. Kamimura et al do not teach adding any additive which does not at least predominantly metal.

New claim 29 recites the deliberate steps of determining the area of higher thermal loading, selecting an additive with a low thermal coefficient of expansion (TCE), determining a sufficient amount of additive to reduce the TCE of said area with higher thermal loading to approximately that of said bordering areas, melting that area (4) which is thermally higher loaded, introducing said sufficient amount of a ceramic material in the form of bristles or powder as an additive into the melt pool (6) resulting from the melting, and resolidifying to develop in the thermal higher loaded area (4) a lower thermal coefficient of expansion (α_2) relative to the thermal lower loaded area (5).

Claim 30 defines the additive as ceramic powder or bristles.

Turning now to Kamimura et al in greater detail, Kamimura et al teach production of an aluminum alloy component of an internal combustion engine (see column 1, lines 12-20, which includes at least one <u>surface</u> area (Abstract line 2; col. 2 lines 20, 26, 35; col. 3 lines 4, 54, etc) made more heat resistant, e.g., resistant to thermal cracking, by a two step process comprising:

(1) melting the surface (e.g. by laser), followed by

(2) overlay welding, e.g. by MIG welding, with introduction of a heat resistant material in the part now molten to form an <u>overlay</u> (col. 2, line 41, 56; col. 3 lines 6, 21; col. 4 line 22 etc.). "The overlay welding may be conducted using the powder additive, which may either be the powder of such a heat resisting <u>metal</u> as Ni, Co, Mo and Cr, or better still, be that of capsule particles, each capsule particle being made from a heat resisting <u>metal particle</u> as its core and <u>metallic particles</u> as its covering envelope." (col. 2, last paragraph,. "fourth embodiment"; similarly, col. 3, first paragraph, "fifth embodiment").

As a sixth embodiment Kamimura et al teach overlay welding with a <u>heat resistant steel</u>.

Kamimura et al then teach at col. 3 line 25 a "seventh" aspect of the invention wherein the surface of the aluminium component is modified by (a) melting, (b) overlay welding with a MIG welder, and (c) performing a second overlay welding step with a MIG welder using a heat resistant steel wire with a core, where the "core particles of the capsule particle may be a heat resisting metal such as Ni, Co, Mo and Cr, or a ceramic such as Al_2O_3,

SiC, Si_3N_4 and CuO; the metallic particles that constitute the envelope may preferably be of a metal that is miscible with the metal of the object part; and the sheath of the composite wire may preferably be of a metal that is miscible with the metal of the object part."

Thus, Kamimura et al only teach surface modifying to make the component more heat resistant using a heat resistant metal, which metal may be in the form of a heat resistant wire with a core with ceramic particles.

Kamimura et al do not teach the deliberate steps of (a) determining the area in which there is higher heat loading, and (b) reducing the thermal coefficient of expansion (TCE) of the higher heat loaded area to generally match the TCE in the other area, such that thermal stress and heat cracks due to thermal stress are eliminated.

That is, as discussed in the present specification, in components of internal combustion engines, such as, for example, cylinder heads or pistons, a problem frequently occurs during thermal cycling in that, in the case of prevention of thermal expansion in higher loaded areas, mechanical tensions are induced in these areas which are so high that, due to the strong plasticization and the therewith associated material fatigue in these areas, crack formation occurs. This conflict of thermal expansion occurs because the thermally higher loaded materials tend to more strongly expand than the thermally less loaded materials. Since the thermally higher loaded areas are generally in the middle of the component, an outwards expansion is not possible, and the result is the above mentioned tensions, in particular pressure tensions, which during the cooling process convert into contraction tensions, which can exceed the materials' strength.

In contrast to Kamimura et al, the present invention solves this problem by deliberately taking steps to eliminate the source of the tensions, as discussed above.

It is well settled that manipulation of a parameter which had not previously been recognized or appreciated as being a result effective parameter may be the basis for patentability. *Ex parte Viscardi*, 136 USPQ 382. Applicant discovered that addition of carbon dioxide will remove static electricity from a printing press. The Examiner rejected apparatus and method claims over a reference which taught addition of carbon dioxide to a printing press, but for a different reason. The court held that there is merit in the contention that a reference patent does, as urged by the Examiner, inherently provide carbon dioxide which will remove static electricity. However, in an absence of appreciation by patentee Catlin (the cited reference) of the fact that carbon dioxide will remove static electricity, there

is no reason why he, or one skilled in the art following his teaching, should inherently adjust the concentration of carbon dioxide for removal of complete static charge; hence, manipulative steps of applicant's claims do not inherently result from reference's disclosure.

Thus, in the absence of appreciation by patentee Catlin of the fact that carbon dioxide will remove a charge of static electricity, there is no reason why this inventor, or one skilled in the art following his teaching, should inherently adjust the concentration of carbon dioxide for the removal of the complete static charge. In short, the manipulative steps of applicants' group of method claims do not inherently result from the disclosure of the basic reference.

Here, similarly, Kamimura et al do not appreciate the present underlying principles, nor teach the deliberate manipulative steps necessary to, eliminate stress despite differential thermal loading (and thus expansion) in an aluminium component of homogeneous composition.

Certainly, Kamimura et al do not teach adding an additive consisting essentially of ceramic powder or bristles.

Accordingly, withdrawal of the rejection is respectfully requested.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Applicants have reviewed these references and have no further comments.

The Commissioner is hereby authorized to charge any fees which may be required at any time during the prosecution of this application without specific authorization, or credit any overpayment, to Deposit Account Number 16-0877.

Should further issues remain prior to allowance, the Examiner is respectfully requested to contact the undersigned at the indicated telephone number.

Respectfully submitted,

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